DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-6, 10, 13-16, 18-29, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urmston (US 4124669) and further in view of Jensen (US 5775047).

Regarding claims 1, 3, 10, 21 and 29, Urmston teaches a method of manufacturing a porous cementitious product, which comprises:

forming a cementitious premix;

casting said premix into a mold of desired configuration;

generating gas bubbles within the premix thereby causing the premix to expand in the formwork;

controlling expansion of the premix in the formwork by confinement of said premix within the mold and enclosed lid and curing, or autoclaving, the premix (Col 2; lines 21-40);

wherein, it is considered that the premix must have a viscosity that will permit gas bubbles generated in the casted premix to migrate throughout the premix. It is considered that the premix must have viscosity to allow the gas bubbles to migrate because Urmston teaches a fully porous product. If the premix were too viscous the

bubbles would remain in the location in which they were introduced to the premix and not create a fully porous product as shown in Fig 2. The viscosity is sufficient to allow the bubbles to expand and it would be obvious to one of ordinary skill in the art that the expanding bubbles would move to some extent in the very least they would move the premix aside as they are expanding.

Regarding the limitation of claim 1 requiring a specific porosity across the cross-section of the product, Urmston is silent as to the exact porosity across the product.

Jensen teaches a similar method of manufacturing a porous cementitious product comprising; forming a foamed cementitious slurry; casting the slurry into a heated mold; wherein the gas bubbles are collapsed at the interface of the mold and slurry interface in order to create a relatively low density core region and higher density outer region, or dense outer skin (Col 3; lines 4-19, Col 4; lines 44-53). Additionally, Urmston teaches reducing the viscosity to permit the migration of bubbles (Col 2; lines 47-59) It would have been obvious to one of ordinary skill in the art to collapse the bubbles at the mold and slurry interface in order to form a smooth, dense outer skin as taught by Jensen.

Neither Urmston and Jensen disclose the product has a maximum porosity of 25% to 60% over a region corresponding to 20% to 80% along the cross-section of the product. However; Jensen teaches collapsing pores as desired around the perimeter of the cast by heating the mold as well as controlling the viscosity of the slurry in order to directly control the coalescing and migration of the bubbles (Col 2; line 12-Col 3; line 33, Col 8; lines 64-68) thus Jensen teaches more than one way to vary the porosity of the

cast slurry as well as vary the location of the pores which is equivalent to varying the porosity distribution. It would be obvious to one of ordinary skill in the art to have modified the method of Urmston by optimizing the migration of the bubbles and the collapsing of the bubbles in order to achieve the desired amount of porosity throughout the slurry as taught by Jensen. Optimization of a variable that has been established as a result effective variable is generally obvious to one of ordinary skill in the art. See MPEP 2144.05

Regarding claim 2, Urmston teaches a heat activated gas-generating agent. (Col 2; lines 41-54).

Regarding claim 4, screeding, troweling, and rolling are known ways of specifically smoothing cement mixtures thus it would have been obvious to smooth the premix after casting using these methods.

Regarding claims 5 and 6, Urmston teaches that vibrating is not necessary (Col 8; line 6) however does not teach away from vibrating. Jensen teaches that vibration, ultrasound, and certain surfactants can be used to collapse bubbles that are resistant to collapse (Col 5; lines 10-18). Thus in view of the combined teachings of Urmston and Jensen regarding claim 1 above, it would have been obvious to further use vibrating to collapse bubble that are resistant to collapse as taught by Jensen.

Regarding claims 13 and 15, the combined teachings of Urmston and Jensen teach a method of manufacturing a porous, cementitious article wherein a dense, strong outer skin is created by collapsing bubbles or pores at the premix and mold interface. Jensen teaches that the density and strength are increased by collapsing the bubbles

within the premix thus it naturally follows that the density and the strength of the article is varied by varying the extent to which gas bubbles generated in the premix are retained.

Regarding claims 14 and 28, it is considered that the strength to density ratio is naturally controlled by choosing the mold size in the method of Urmston, because this limitation the room in which the premix may expand, wherein the mold size is considered a matter of design choice to one of ordinary skill in the art.

Regarding claim 16, Urmston teaches finishing articles by cutting (Col 3; lines 19-37).

Regarding claims 18-20 and 22-25, Urmston teaches a cementitious product with dry densities from 30 lbs/cu.ft. to 70lbs/cu.ft. (See Examples 1-12), which is within the claimed range. Urmston is silent as to the thermal conductivity or compressive strength of the finished product however where the combined teachings of Urmston and Jensen teach the method of present claim 1, thus one of ordinary skill in the art at the time of the invention would expect the same product.

Additionally, Urmston teaches the strength depends on the pressure developed by the mold (Col 7; lines 50-55), thus it is considered that the pressure may be optimized in order to achieve the desired strength of the final product.

Urmston also teaches all of the densities and strengths of the individual ingredients for the premix composition, one of ordinary skill in the art would recognize that the amount of each ingredient may be optimized through routine experimentation in order to achieve the desired density of strength or density of the final product.

Optimization of a variable that has been established as a result effective variable is generally obvious to one of ordinary skill in the art. See MPEP 2144.05

Regarding claim 26, Urmston and Jensen both teach forming concrete building articles however do not specify a flat slab, wall panel, roofing tile, etc. The article to be manufactured is considered a matter of design choice. Where the article obtained is a direct reflection of the shape of the mold, it would have been obvious to one of ordinary skill in the art at the time of the invention to have used the method of manufacturing a concrete article taught by Urmston and Jensen to manufacture any concrete article desired.

Regarding claim 27, Urmston specifically teaches creating a patterned surface on the product (Col 8; lines15-23)

Regarding claim 32, Urmston teaches providing a lid for restraining the rising of the premix, wherein the lid is configured to let gas escape from the expanding casted premix (Col 2; lines 35-40, Col 6; lines 1-3)

3. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urmston (US 4124669) and Jensen (US 5775047) as applied to above, and further in view of Kovacs et al. (WO 98/42637).

Regarding claim 7-8, the combined teachings of Urmston and Jenson teach a method of forming a porous cement article wherein the bubbles to create the pores are provided to the cast premix. Urmston and Jenson teach providing air bubbles to the cement premix using aluminum powder or by adding quantities of foam or blowing air

into the mixture however, Urmston and Jensen are silent as to how the air is blown into the premix and do not specifically disclose introducing gas bubbles at selected locations within the cast premix by use of sparging apparatus.

Kovacs discloses a method of making a foamed masonry product comprising a cement slurry, or cementitious premix, and where gas is dispensed within the cement slurry using an injector, wherein the injector comprises one or more lance nozzles with a plurality of capillary holes for dispersing gas at various locations within the slurry in order to create bubbles or pores within the cement mixture. Urmston and Jenson teach mixing a heated foaming agent or blowing air into the premix to generate bubbles, while Kovacs discloses using a lance nozzle to inject gas in order to generate bubbles within the premix. Thus it would have been obvious to one of ordinary skill in the art to modify the method taught by the combined teachings of Urmston and Jensen with the injection nozzle taught by Kovacs to obtain the predictable result of creating bubble, or pores, within a cementitious premix and producing a cementitious product that is lighter than a cementitious product without the bubbles incorporated therein. See MPEP 2141

Regarding claim 9, Kovacs teaches a stationary lance to introduce gas into the contentious slurry with mixing to provide an even distribution of the gas suspension through the premix. Kovacs is silent about moving the lance through the slurry; however it would have been obvious to one of ordinary skill in the art to have moved the lance through the premix during injection of the gas in order to provide the injection of gas and mixing simultaneously.

4. Claims 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Urmston and Jensen as applied above, and further in view of Henrichsen (US 2002/0038616).

Regarding claims 11-12, the combined teachings of Urmston and Jensen do not teach using a superplasticizer to modify the viscosity, or flow.

Henrichsen discloses a method for making a molded concrete article with a varying porosity. Henrichsen specifically teaches using a superplasticizer to control the viscosity and flow and yield a highly stable low yield strength, concrete article (abstract, [0009]-[0011]).

5. Claims 18-20, 23, and 25 are additionally rejected under 35 U.S.C. 103(a) as being unpatentable over Urmston (US 4124669) and Jensen (US 5775047) as applied above and further in view of Shi et al. (US 20020117086).

Further regarding claims 18-20 and 23, Urmston and Jensen disclose a method of making a porous cementitious product as discussed above; however do not disclose all of the properties of the cementitious slurry. Shi also discloses a method for making a porous cementitious product comprising a cementitious slurry; infusing the slurry with bubbles and curing the slurry to produce a lightweight concrete products with compressive strengths ranging from 1000 psi, or 6.89 MPa, to about 6,000 psi, or 41 MPa, and preferably of 14.3 MPa wherein the compressive strength after 14 hours of curing is 75% to about 90% of the 28 day curing strength. Furthermore, Shi discloses the concrete products having a dry density ranging from 45 lbs/ft^3, or 720 kg/m^3, to

about 90 lbs/ft^3, or 1441 kg/m^3, and preferably about 1086 kg/m^3. Shi also discusses the use of fiber ensures the stability of the cellular structure and the aggregate in the concrete mixture slurry, and increases the flexural strength (Tables 1-5, [0020], [0029], and [0071]).

Urmston, Jenson and Shi all disclose making cementitious products by incorporating voids within a cement/ concrete slurry. Urmston and Jensen teach a method for manufacturing the porous cementitious product however; each is silent about the composition of the cementitious slurry to be cast into the mold. Shi discloses a high strength concrete mixture comprising a specific composition and selection of additives for making cementitious product with specific properties as discussed above thus it would have been obvious to one of ordinary skill in the art to modify the method taught by the combined teachings of Urmston and Jensen with the cementitious composition with the properties as taught by Shi to yield the predictable results of a molded cementitious product with a dense outer skin and a desirable compressive strength and dry density. Furthermore, it would have been obvious to one of ordinary skill in the art through ordinary experimentation to determine the optimum composition comprising the additives as taught in Shi to achieve the a slurry and product with optimal compressive strength, flexural strength, plasticity, impact resistance and dry density. See MPEP 2141 and 2144.04.

Regarding claim 25, Shi discloses a product with a water content ranging from 13.8 wt % to about 33.3 wt% which can be considered low.

Response to Arguments

6. Applicant's arguments filed 1/25/2011 have been fully considered but they are not persuasive.

Applicant argues that examiner is incorrect in stating Urmston is silent as to the porosity across the cross section of the molded product. Applicant believes Urmston teaches a homogenous porosity as evident by paragraph bridging columns 7 and 8 of Urmston. In response to this argument it should be noted that Urmston teaches a constant density and homogenous material (Col 7; line63-65) as well a homogenous mixture in reference to the distribution of aggregate (Col 2; lines 55-60) however; Urmston is silent as to the exact porosity across the cross section of the product thus Jensen is relied on for teaching a method of altering the porosity across the cementitious product.

Applicant also argues that *it is believed* Urmston teaches that the gas bubbles do indeed remain in the location in which they were produced. Applicant states it is accepted that in Urmston the premix must have a viscosity that allows gas bubbles to be generated but that the premix viscosity must be sufficiently high to prevent migration of gas bubbles once generated because migration of gas bubbles would of course lead to a porous structure which is not homogeneous. Applicant provides no evidence to support this argument. Furthermore, this argument fails at least because Urmston does not teach an article with homogenous porosity. Urmston teaches collapsing bubbles to form a dense outer skin and thus reducing the porosity at the perimeter of the of the molded article. Furthermore, Urmston teaches aeration begins prior to pouring the mix

into the mold and then continues after pouring to expand the mix and fill the mold. If the slurry is of a viscosity to allow the generation of bubbles as admitted by applicant it would be expected that the viscosity is such that the expanding bubbles may move the premix then the viscosity is such that the bubbles may migrate to some extent.

Applicant argues with respect to Jensen that the slurry is prefoamed before being introduced into the mold and thus this aspect of the methodology of Jensen is fundamentally different from that applied where gas bubbles are generated in the premix after casting in a mold. In response to this argument, both Urmston and Jensen teach this processes for preparing light weight concrete blocks wherein Urmston teaches aeration both before and after the mix is put into the mold (Col 2; lines 30-39), thus Jensen is not fundamentally different from Urmston.

Applicant remarks it is stated in Jensen: "the volume of pores tends to be uniformly distributed throughout the block, i.e., each cubic inch of the block has about the same total volume of pore space, except near the outer surface of the block, which has a much lower volume of pore space because of the destruction of air bubbles by the heated mold surface" (Column 8, lines 52-57). Applicant argues that this citation proves Jensen produces a product that has a dense outer surface but that has a homogeneous porosity profile across a cross-section. However; the term “near” is a matter of perspective which is subject to interpretation. It would be expected by one of ordinary skill in the art there is not a clear line of demarcation between the area " near the outer surface of the block, which has a much lower volume of pore space” and the remainder of the block. One of ordinary skill in the art would also recognize that heat transfers and

not only the bubbles touching the mold would be destroyed thus there would be an area of transition that is also of lower porosity but not as low as the dense outer layer.

Applicant also argues that the methodology taught in Urmston and the methodology taught in Jensen would not lead to the production of a product having the porosity profile as called for in claim 1 of the present application (the product has a maximum porosity of from 25 to 60% over a region corresponding to 20 to 80% along the cross-section of the product). The Examiner maintains the position recited in the rejection above. Urmston teaches a method of molding and aerating a cementitious premix as required by present claim 1. Jensen teaches controlling the migration and collapse of bubble to achieve a desired porosity profile wherein there is a low porosity near the outer regions of the molded articles. Therefore, it would be obvious to one of ordinary skill in the art to have modified the method of Urmston by optimizing the migration of the bubbles and the collapsing of the bubbles in order to achieve the desired amount of porosity throughout the slurry as taught by Jensen. The court has held that optimization of a variable that has been established as a result effective variable is obvious to one of ordinary skill in the art. See MPEP 2144.05

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jodi Cohen whose telephone number is 571-270-3966. The examiner can normally be reached on Monday-Friday 7:00am-5:00pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Daniels can be reached on 571-272-2450. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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